Department of Agriculture, C. P.

REPORT

ON THE

NAGPUR EXPERIMENTAL FARM

IN THE

CENTRAL PROVINCES

FOR

THE YEAR 1902-1903.

Ending 31st March 1903.

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No. $\frac{3840}{7}$.

FROM

F. G. SLY, ESQ., I. C. S.,

COMMISSIONER OF SETTLEMENTS AND AGRICULTURE,

Central Provinces,

TO

THE SECOND SECRETARY TO THE HON'BLE THE CHIEF COMMISSIONER,

REVENUE DEPARTMENT,

Central Provinces

agpur, the 18th August 1903

SIR,

I have the honour to submit the Annual Report on the working of the Experimental Farms, Nagpur and Telinkheri, for the year ending the 31st March 1903.

NAGPUR EXPERIMENTAL FARM.

Programme of Experiments.

2. The most important feature of the year's work has been a revision of the programme of experimental cultivation, which has been made at the instance of the Inspector-General of Agriculture. The principal experiments in the past have been the trial of different manures upon rabi crops with and without irrigation. These experiments were conducted in plots scattered over the farm, but they have now been concentrated with the result that it has been possible to enlarge their scope without any material change in the general scheme. The experiments to test the effect of phosphatic manures on different oil-seeds have been abandoned because they gave no useful results. Some most important experiments have now been started with kharif crops, the principal being to test the effects of different manures upon cotton and juar and of rotations. Nagpur is situated in the cotton-juar country, and these experiments should give useful information concerning these crops. It is intended in future that the investigation of problems connected with these two staples should be the main work of the farm. The investigation of problems connected with rabi crops will thus be relegated from the principal to a subordinate position. Nagpur is not a true rabi tract and these problems can be better investigated in the more suitable land acquired for the new Experimental Farm at Hoshangabad. The second new farm at Raipur will mainly be devoted to problems connected with rice cultivation. The organization of Experimental Farms will thus deal with the principal staples—cotton, juar and kharif crops at Nagpur, wheat and rabi crops at Hoshangabad rice at Raipur.

Character of the season.

3. The year's rainfall was only 29·88 inches, which is about half the average, but in spite of this great deficiency, the year was distinctly above the average, both for kharif and rabi crops. The short rainfall was very well distributed for agricultural requirements. Rice was somewhat damaged, whilst the tur (*cajanus indicus*) crop was

destroyed by caterpillars, but other kharif crops, notably cotton and juar, gave excellent yields. All the rabi crops yielded outturns considerably above the average, thanks to good showers in December.

Experiments with manures.

4. The experiments with manures, with and without irrigation and with and without rotation of crops, generally confirm the results of previous years' experiments. Cattle-dung has again shown its superiority as a general manure. Saltpetre has also given good results, more particularly when applied as a top-dressing. There certainly seems a field for the profitable use of this manure, especially in conjunction with irrigation, so that any measures for cheapening its production should prove of benefit to the cultivator. Green-manuring has been particularly successful.

Varieties of crops.

5. The scope of the farm work in testing different varieties of crops has been much enlarged. The most important experiments were made with cotton (93 varieties), juar (57 varieties) and wheat (153 varieties). These included varieties grown in the Central Provinces and in other parts of India and also American, Egyptian and Sea Island cottons, and Australian wheats. The indigenous varieties generally gave much better results than the foreign exotics. The Egyptian cotton cannot be grown without irrigation, whilst the American cottons suffered considerably from the monsoon rainfall although it was exceptionally light. The "Jaunpore" variety of maize again proved its superiority over the best American varieties. Amongst the juars, the varieties known as "Ganeri," "Saoner" and "Halki" show most promise, whilst a Bombay variety known as "Dharwari," which is grown in the Dharwar District as a mixture with rice, seems likely to turn out a success in the districts of Chhattisgarh, where the rainfall is generally too heavy for other varieties. The collection from districts of other crops has resulted in bringing to notice two varieties, which seem much better than those in ordinary cultivation—a large-seeded *chaoli* or *barbati* (*vigna catiang*) from Sambalpur, and a large-seeded tur (*cajanus indicus*) from Bilaspur. The careful testing of indigenous varieties of crops seems to be a field of work in which some successful results can be obtained.

Plant-breeding experiments.

6. Two important series of experiments were linitiated under a definite scheme drawn up by the Inspector-General of Agriculture, the first being the raising of new varieties of cotton, and the second being the raising of a rust-resistant wheat. The object of the first series is to raise improved hybrid cottons which will combine the hardiness and prolificness of the inferior local varieties with the fine lint of the best indigenous and some foreign varieties. This seems a much more hopeful scheme than that of acclimatizing foreign exotics.

Plant diseases.

7. I have mentioned above the important scheme started for the breeding of a rust-resistant wheat. There was some rust on the farm late in the season, which was successfully withstood by the hybrid of *haura* and *mundia pissi* raised in previous years. It would seem that each province must endeavour to work out its own salvation from wheat-rust, for a variety rust-resistant in one part is not, apparently, so in other parts of India. Another important investigation, commenced at the farm by Dr. Butler, Cryptogamic Botanist, was that of a fungoid disease of *tur* (*cajanus indicus*). This disease causes considerable damage on the farm, particularly in plots where tur has been grown for more than one year. I also believe that the disease is widely spread throughout the province, although cultivators often ascribe to cold and frost the death of plants attacked by the fungus. It is to be hoped that Dr. Butler's investigations will result in the discovery of some practical remedy. Trials were made of several fungicides for the eradication of smut, with the result that a solution of copper sulphate seems to be the cheapest effectual remedy.

General.

8. Ensilage was again made with successful results. The report contains some useful information concerning the trial of implements. The Swedish plough is gradually becoming known, a fair number having been sold. A turn-wrest plough by Cook and Sons

gave excellent results, but its cost is too great to allow of its purchase by cultivators. The usefulness of the farm has been much increased by a large distribution of seeds. All the seed distributed was selected seed of new or improved varieties grown on the farm, the object being to introduce to the notice of cultivators something better than they can get elsewhere. No attempt was made to fill the function of an ordinary grain-lender.

Telenkheri Farm.

9. The conditon of this farm is rapidly improving, much of the land having now been brought into a fair state of tilth. A substantial profit is shown as the result of the year's working. Its main object is to raise seed of new and improved varieties of crops for distribution purposes. The fuel and fodder reserves yield an abundant supply of grass, but the attempt to afforest the bare hills has not met with much success. Young trees planted out will not live without artificial watering, which is most difficult to arrange.

Cattle-breeding Farm.

10. The Cattle-breeding Farm has made a good start. Some buildings have been erected, but will shortly need enlargement. The herd was started with the purchase of 34 cows with 12 calves at foot from the famous Jaitpur herd, which is believed to be the purest type of Arvi cattle, the best breed of the Nagpur country. The bull was obtained from Arvi itself. The object of this farm is to improve this breed of cattle by careful breeding so as to produce good bulls for distribution to cultivators. The stock unfit to become breeding bulls will be utilized as agricultural bullocks. No attempt will be made to develop the milking qualities of the breed. The stock has undoubtedly improved with careful feeding and management.

The Sewage Farm.

11. The Sewage Farm shows a successful year's working. The cultivators obtained good crops and paid their rents without difficulty. The farm now yields a handsome profit, which should be an inducement to other municipalities to take up the question of the profitable disposal of their sewage.

Conclusion.

12. I have not attempted in this short review to notice one important aspect of the farm's work, namely, how far it has been successful in influencing the agriculture of the Province generally. This subject will be noticed in its proper place in the Report on the Department of Agriculture, but I may state that the Farm Superintendent, Mr. Bhaya Lal Dubey, has shown great interest in this matter. He has been sent to the meetings of several District Agricultural Associations, where he has helped them in framing programmes of practical work. His management of the farm has been satisfactory, which he himself will be the first to admit is largely due to the experienced and careful supervision of Mr. R. S. Joshi, the Assistant Director of Agriculture.

I have the honour to be,

Sir,

Your most obedient servant,

F. G. SLY,

Commissioner of Settlements and Agriculture.

No. 200.

FROM

MR. BHAYALAL DUBEY, L. AG.,

SUPERINTENDENT, GOVT. EXPERIMENTAL FARM,

Nagpur,

TO

THE COMMISSIONER OF SETTLEMENTS AND AGRICULTURE,

Central Provinces.

SUBJECT:

Report on the Nagpur and Telinkheri Experimental Farms for the year 1902-03.

Nagpur, the 27th July 1903.

SIR,

I have the honour to submit the Annual Report for the year ending the 31st March 1903 on the working of the Experimental Farms at Nagpur and Telinkheri.

I.—HISTORY OF THE NAGPUR FARM.

2. The Nagpur Experimental Farm was established in 1883, in which year the former Model Farm was given up and the present site selected in its stead. The land is close to Nagpur and is moderately typical of the black cotton soil which is to be found in the Central Provinces. It consists of a fairly level piece of land of about 90 acres in extent, out of which about 70 acres are under cultivation, the rest being occupied by roads, buildings and waste land. The soil is of the black cotton type, but of somewhat inferior quality. It varies in depth from 4 to 10 feet and is situated upon gneiss rock. The natural drainage is, however, bad, in consequence of which crops frequently suffer. The road to Ambajheri which intersects the farm acts as an embankment which holds up the water. New drains were opened in 1896, but they have not improved the drainage of the farm as much as is desired.

II.—CHARACTER OF THE SEASON.

3. The following table compares the rainfall of the year as registered on the farm with the average of the preceding 28 years:—

Month.	Number of rainy days.	Rainfall.	Average of 28 years preceding.	Month.	Number of rainy days.	Rainfall	Average of 28 years preceding.
		Inches.	Inches.			Inches.	Inches.
				Brought forward ...	36	26·77	43·36
April ... 1st half ...	...	·04	·19	October. 1st half ...	1	·22	1·18
April ... 2nd half ...	...	...	·29	October. 2nd half ...	2	·55	1·24
May ... 1st half ...	...	·06	·21	November. 1st half ...	1	·60	·60
May ... 2nd half ...	...	·02	·26	November. 2nd half ...	...	...	·17
June ... 1st half ...	2	1·40	2·69	December. 1st half ...	4	1·59	·10
June ... 2nd half ...	1	·10	5·06	December. 2nd half ...	...	...	·26
July ... 1st half ...	9	8·36	6·64	January. 1st half ...	...	...	·35
July ... 2nd half ...	4	2·28	7·50	January. 2nd half ...	...	...	·19
August. 1st half ...	...	·12	6·89	February 1st half ...	...	...	·19
August. 2nd half ...	10	11·15	5·05	February 2nd half ...	1	·15	·25
September. 1st half ...	6	2·34	4·50	March ... 1st half ...	...	...	·22
September. 2nd half ...	4	·90	4·08	March ... 2nd half ...	...	...	·19
Carried over ...	36	26·77	43·36	GRAND TOTAL ...	45	29·88	48·30

NOTE.—A rainy day is taken as one on which there was a fall of not less than 10 cents.

4. The regular monsoon did not arrive till the beginning of July, in consequence of which the sowings of kharif crops were somewhat delayed. The germination of all the crops was good. There was a break in the month of August which caused great anxiety, but at the critical stage favourable rains saved the young plants. This break, however, affected the paddy crop at the Telinkheri Farm, the loss of outturn being estimated at about one-fourth. The subsequent rains turned out most favourable to all the crops. The total rainfall of the year only amounted to 29·88 inches as against 37·54 inches of last year and an average of 48·30 inches. Tur (*Cajanus Indicus*), which gave early promise of a bumper crop, was greatly damaged by cater-pillars. In some places in the district the ravages of this pest completely destroyed the crop. The first crop was similarly destroyed on the farm, but the crop was intentionally allowed to remain unharvested to see if we could get the plants to flower a second time with the assistance of some showers of rain which had fallen at that time. The crop indeed flowered and put forth new pods which gave a small yield. The pest being helped by long cloudy weather continued its damages to gram, the outturn of which was reduced nearly to half.

5. The rabi crops were sown in due time and the germination was good. Linseed flourished from the beginning to the end. Wheat germinated well; but in highlying fields the want of moisture in the soil caused a proportion of plants to wither, which produced many gaps. But the favourable winter rains improved the prospects; the wheat freely tillered and gave a good outturn.

III.—EXPERIMENTS WITH MANURES.

6. The different manures experimented with on the farm belong to the class "natural." The use of the chemical manures has become a thing of the past because the Ville series of experiments which did not yield any substantial results has been discontinued.

The natural manures are—

(1) Stall-dung.

(2) Saltpetre.

(3) Bone-dust.

(4) San-hemp (*Crotolaria juncea*) ploughed in green.

(5) Kadoojira (*Vernonia cineria*).

(6) Ashes of cattle-dung.

An important change has been made in the quantity of manure used for experimental purposes. Formerly the manures were applied at a fixed weight per acre irrespective of the quantity of nitrogen contained in them. The amount of manure now applied is that required to give a desired quantity of nitrogen per acre. In this matter our thanks are due to the Agricultural Chemist to the Government of India who kindly analyses the manurial stuff which we send to him and gives us the results of his analysis.

The description of the manures is given below :—

(1) *Stall-dung.*—The term stall-dung is applied to dung collected from the cattle shed from day to day and stored in an ordinary pit. The pits are covered over with straw to check evaporation and are watered occasionally in the hot weather between March and June. It contains no urine, but only the solid excrements of the bullocks unmixed with straw. Sample of this manure sent to Dr. Leather gave the following analysis :—

Moisture	...	54·60
Organic matter	...	*22·64
Soluble mineral matter	...	6·99
Sand	...	15·77
Total	...	100·00
Containing nitrogen	...	*·89
Containing phosphoric acid	...	·75

(2) *Saltpetre.*—The saltpetre that is used on the farm is crude saltpetre obtained from Cawnpore through the Director of Agriculture, United Provinces of Agra and Oudh. The sample of this material analysed by the Agricultural Chemist was found to contain—

Moisture	...	0·10
Nitrogen	...	11·78

The general application of saltpetre which has been found to give the best results is 80 lbs. per acre. This quantity is top-dressed along the lines of growing crops, and in case of rice it is sprinkled evenly all over the plots. This is done when the plants are 8 to 10 inches high. In case of transplanted rice it should be top-dressed after transplantation when the plants have established themselves. The quantity used in the experimental plots is according to the percentage of nitrogen.

(3) *Bone-dust.*—This manure is prepared in the following manner. Bones of animals are ground in a mill, such as is usually used for grinding lime (chunam). They are then passed through a sieve and the fine powder is used. The results of the analysis are—

Moisture	...	4·01
Organic matter	...	18·19
Calcium phosphate	...	37·28
Calcium carbonate, &c.	...	17·16
Sand	...	23·36
Total	...	100·00
Containing nitrogen	...	1·46

This stuff seems to contain too little nitrogen which should be about 3 per cent. On the farm bone-dust has not given satisfactory results with any crop, and its use is therefore restricted to the experimental plots only. Before we adapted this method of application according to the percentage of nitrogen it was used at the rate of 360 lbs. per acre.

(4) *San-hemp (Crotolaria juncea) ploughed in green.*—The seed of the hemp is sown broadcast at the beginning of the rains at the rate of 100 lbs. per acre. In the middle of August, as the plants approach maturity, they are up-rooted by hand and are buried in the furrows made by the Swedish plough. The plant san-hemp is one of the order *Leguminosæ* sub-division *Papilionaciæ*, which possesses the property of storing nitrogen from the atmosphere by the aid of nodules at its roots.

(5) *Kadoojira (Vernonia cineria).*—This weed grows in abundance on the waste lands of the farm. It is collected from these waste lands and is ploughed in by the same method as has been described above in the case of san-hemp.

(6) *Ashes of Cattle-dung.*—Cattle-dung is made into cakes, which are burnt and reduced to ashes.

Revision of experiments.

7. Last year the plan of experiments was revised; some experiments were eliminated because they have given unreliable results in the past and are not likely to give useful results in the future; but at the same time the general aim of the experiments hitherto carried on has not been materially changed. The more important experiments were extended without, however, altering their scope. Also by this revision the grouping of the experiments has been improved, so that with a much maller number of plots an equally comprehensive scheme of experiments was obtained. Another important improvement which is now in progress is an extension of the irrigation system. A new main is being laid from Telenkheri tank with distributaries over the farm.

The strips of field boundaries left waste between the experimental plots have now been ploughed up, because the grass caused great unevenness of crop along the head lands. The head lands now undergo ordinary tillage and grow some crop other than that of the adjacent experimental plots.

Experiments with different manures.

8. According to the new scheme the experiments to test the comparative value of different manures or different methods of manuring on various important crops have been concentrated into five series. The oldest of these are those which are conducted on the two series of 8 plots A and B, in which wheat is annually manured with different manures, the only difference in the treatment being that the A series is irrigated whilst the B series does not receive irrigation. Four additional plots have now been added to each of the above named series, and these plots also will be under the manure experiments which previously were conducted in some other fields of the farm. We have thus concentrated experiments with manures on wheat in these two series, leaving only series C, in which the effect of manuring with cattle-dung in June and August will be observed on irrigated and dry wheat. Some important experiments with manures on kharif crops have been added. In series D, the effect of different manures on cotton in rotation with juar-tur is to be tested, while series J is intended to show the effects of different manures on juar-tur grown continuously.

9. The results obtained in the case of each of these experiments during the year under report are tabulated in the following statements, and such remarks as are deemed necessary have been added in each case :—

SERIES A. SUBJECT.—*Continuous manure experiments with irrigated wheat.*

Plot I.—Area ·10 acre. Manured with saltpetre (40 lbs. nitrogen per acre).
" II.— " ·10 " " bone-dust (40 lbs. nitrogen per acre).
" III.— " ·10 " " saltpetre and bone-dust (saltpetre 25 lbs. nitrogen per acre and bone-dust 15 lbs. nitrogen per acre).
" IV.— " ·10 " " cattle-dung (40 lbs. nitrogen per acre).
" V.— " ·10 " " cattle-dung and bone-dust (cattle-dung 25 lbs. nitrogen per acre and bone-dust 15 lbs nitrogen per acre).
" VI.— " ·10 " " ashes of cattle-dung (40 lbs. nitrogen per acre.)
" VII.— " ·10 " Unmanured.
" VIII.— " ·10 " Green manured with *san* (seed 100 lbs. per acre).
" IX.— " ·10 " Green manured with *kadoojira*.
" X.— " ·10 " Manured with saltpetre (20 lbs. nitrogen per acre).
" XI.— " ·10 " " " (20 lbs. nitrogen per acre top-dressed).
" XII.— " ·10 " " farm-yard manure (40 lbs. nitrogen per acre).
Crop—wheat (*haura*)—Nagpur. Irrigated once from 30th January to 3rd February 1903.

No. of plot.	OUTTURN PER ACRE.							
	AVERAGE OF PRECEDING 5 YEARS 1890-91 TO 1894-95.		AVERAGE OF PRECEDING 6 YEARS EXCLUDING 1899-1900.		1902-03.			
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Value.	Gain in value on plot No. VII.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.
I ...	931	1,789	801	999	1,647	2,842	76 4 6	36 11 8
II ...	626	954	510	685	1,327	1,702	59 4 11	19 12 1
III ...	1,012	1,924	757	1,016	1,476	1,673	65 2 7	25 9 9
IV ...	717	1,217	941	1,185	1,435	1,595	63 3 9	23 10 11
V ...	739	1,343	834	1,255	1,505	1,975	67 6 10	27 14 0
VI ...	584	915	583	688	1,090	1,290	48 5 2	8 12 4
VII ...	486	820	353	467	882	1,167	39 8 10	...
VIII ...	564	1,090	569	796	1,260	1,500	55 14 3	16 5 5
IX ...	...	...	...	...	1,175	1,345	51 14 9	12 5 11
X ...	...	...	...	...	1,300	1,960	59 2 10	19 10 0
XI ...	...	...	...	...	967	1,342	43 9 5	4 0 7
XII ...	...	...	...	...	1,117	1,392	49 12 4	10 3 6

The year under report was exceptionally good for wheat, the outturns being very high. The wheat was sown on 16th October and harvested on 23rd March. Owing to opportune winter rains the series was irrigated only once on January 30th. The last four plots are newly added to the series so that there are no averages for the preceding year. The plot manured with saltpetre heads the list with an outturn nearly double that of the unmanured plot, while the gain in value is still greater. It is clear from the figures that the saltpetre plot also produces proportionately a larger quantity of straw. The averages of preceding years of this plot show, however, that the outturn is diminishing annually, which fact tends to show that the stores of the soil other than the nitrogen and potash found in saltpetre are deficient; but this year's outturn, in an exceptionally good season for wheat, is as high as 1,647 lbs. per acre.

The bone-dust plot has given fairly good results this year. This stuff in conjunction with either saltpetre or cattle-dung has been giving throughout better results than when applied alone. This seems due rather to the effects of saltpetre and cattle-dung than the bone-dust. The previous year's outturns in plots manured with bones alone show that bones are not of much manurial value on the farm soil, so that this year's outturn is exceptional. The superiority of cattle-dung (a general manure) as shown by the average figures of Plots IV and V is fully established. When dung is applied continuously the accumulation of organic matter increases and the acquired fertility also does so. The outturns in the former years are lower, because the cattle-dung applied in previous years contained most of its nitrogen in the organic form and this took some time to be converted into nitric acid, which, combined with gases, produces the nitrates in which form only the nitrogen is taken

up by the roots; hence the dung applied in previous years supplies active ingredients afterwards. The farm-yard manure in the 12th plot gives an outturn of 1,117 lbs. per acre, and from the above experience we should hope that its produce will gradually increase. This is the first year when this plot was included in the A series. The figures of Plot No. VI show that the fertility of soil cannot be upheld by the addition of mineral matter only; but that there must be some supply of organic matters which generally contains most of the useful ingredients and also improves the mechanical condition of the soil. This year's figures being higher may contradict the above; but we have got the outturns raised all through and that also in very nearly the same proportion. The unmanured plot shows the expected results of soil exhaustion. The green manured plots have also given fair results, and we can recommend that in places where cattle-dung is not sufficient to supply the wants of ryots, green manuring may be substituted for the same.

SERIES B. SUBJECT.—*Continuous manure experiments with dry crop wheat.*

Plot I.—Area ·10 acre. Manured with saltpetre (40 lbs. nitrogen per acre).
" II.— " ·10 " " bone-dust (40 lbs. nitrogen per acre).
" III.— " ·10 " " saltpetre and bone-dust (saltpetre 25 lbs. nitrogen per acre and bone-dust 15 lbs. nitrogen per acre).
" IV.— " ·10 " " cattle-dung (40 lbs. nitrogen per acre).
" V.— " ·10 " " " and bone-dust (cattle-dung 25 lbs. nitrogen per acre and bone-dust 15 lbs. nitrogen per acre.)
" VI.— " ·10 " " ashes of cattle-dung (40 lbs. nitrogen per acre.)
" VII.— " ·10 " Unmanured.
" VIII.— " ·10 " Green manured with *san* (seed 100 lbs. per acre).
" IX.— " ·10 " Green manured with *kadocjira*.
" X.— " ·10 " Manured with saltpetre (20 lbs. nitrogen per acre).
" IX.— " ·10 " " " (used as a top-dressing).
" XII.— " ·10 " " farm-yard manure (40 lbs. nitrogen per acre).

Crop—wheat (*haura*)—Nagpur.

No. of plot.	OUTTURN PER ACRE.									
	AVERAGE OF 5 YEARS, 1885—89.		AVERAGE OF 5 YEARS, 1890—94.		AVERAGE OF 6 YEARS EXCLUDING 1899-1900.		1902-03.			
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Value.	Gain in value on Plot No. VII.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.
I ...	1,133	1,711	751	1,468	475	679	1,031	1,269	45 15 11	12 14 8
II ...	891	1,388	534	882	331	535	922	1,287	41 9 5	8 8 2
III ...	1,094	1,751	865	1,538	433	650	1,049	1,291	46 10 11	13 9 8
IV ...	913	1,520	627	1,393	375	641	1,229	1,571	57 11 4	24 10 1
V ...	953	1,415	666	1,224	567	881	1,301	1,779	58 8 9	25 7 6
VI ...	949	1,598	576	1,125	367	593	1,104	1,316	48 15 7	15 14 4
VII ...	799	1,297	418	796	196	376	726	984	33 1 3	...
VIII ...	705	1,137	584	1,115	273	489	1,016	1,304	45 6 8	12 5 5
IX ...	...	...	...	...	...	...	1,252	1,727	56 6 5	23 5 2
X ...	...	...	...	...	..	...	1,262	1,687	56 10 5	23 9 2
XI ...	...	...	...	...	...	...	780	1,020	34 14 11	1 13 8
XII ...	...	...	...	...	...	...	919	1,141	40 15 0	7 13 9

B Series.—This series is the duplicate of the A series, but the plots are not irrigated. The general remarks on the A series plots apply to this series also. By comparing the outturns of the two series in the year under report it is easily seen how far irrigation helps to increase the yield. In the year under report, owing to winter rains, the crop has made use of the saltpetre to a much greater extent than it did in the last year; but still we see a wide margin in favour of the irrigated plot, which shows that saltpetre gives the most desirable results when the crop is irrigated, good results when favoured by two or three showers in winter, and poor results when the year is a dry one. The results in the four new plots cannot be relied upon as they were influenced by the treatment received in previous years. The green manured plots in both the series have given better results this year, because the winter rains favoured its decomposition and thereby the plant food was made available for plants.

SERIES C. SUBJECT.—*Effect of manure on irrigated and unirrigated wheat applied in June and August.*

Plot I.—Area ·10 acre. Cattle-dung (40 lbs. nitrogen per acre) in June.
" II.— " ·10 " " " " " in August.
" III.— " ·10 " " " " in June.
" IV.— " ·10 " " " " in August.

Crop—wheat (*haura*)—Nagpur.

Number of plot.	Outturn per acre.			Gain in value on plot manured in June.	Remarks.
	Grain.	Straw.	Value.		
	lbs.	lbs.	Rs. a. p.	Rs. a. p.	
I ...	1,042	1,617	47 9 6	...	Irrigated on January 30th 1903.
II ...	1,126	1,584	51 4 5	+3 10 11	
III ...	861	1,509	39 15 4	...	Unirrigated.
IV ...	836	1,204	37 13 6	−2 1 10	

C Series.—The results of the first two irrigated plots show that manuring in August is more profitable than doing the same in the month of June. This, one may consider to be natural enough, because the plot manured in June may lose some of its soluble nutriments by surface washing due to heavy rains in July and beginning of August; but quite contrary is our experience of Plots III and IV which were unirrigated and the outturns of which show that manuring in June is more useful. This may safely be attributed to the simple fact that the June manured plot had more time to get the manurial ingredients in the assimilable condition, whereas the August manured plot had very little time to do so. In the second plot irrigation will help to make the plant food soluble, which will not be the case in the fourth which is unirrigated. Some time must elapse before any reliable conclusion can be arrived at.

SERIES D. SUBJECT.—*Effect on cotton and juar-tur (mixed) in rotation of various manures.*

Plot I.—Area, ·20 acre. Manured with bone-dust (40 lbs. nitrogen per acre).
" II.— " ·20 " Unmanured.
" III.— " ·20 " Manured with farm-yard manure (40 lbs. nitrogen per acre).
" IV.— " ·20 " " farm-yard manure (20 lbs. nitrogen per acre).
" V.— " ·20 " " poudrette (40 lbs. nitrogen per acre).
" VI.— " ·20 " " saltpetre (40 lbs. nitrogen per acre).
" VII.— " ·20 " " saltpetre (20 lbs. nitrogen per acre) used as a top-dressing.
" VIII.— " ·20 " " bone dust and saltpetre (bone-dust 15 lbs. nitrogen per acre and saltpetre 25 lbs. nitrogen per acre).

Crop—cotton (*jari*)—Nagpur—in year under report.

No. of plot.	Outturn per acre.			Gain in value on plot No. II.	Remarks.
	Lint.	Seed.	Value.		
	lbs.	lbs.	Rs. a. p.	Rs. a. p.	
I	237	407	51 10 11	0 3 1	
II	235	419	51 7 10	...	
III	430	769	94 1 4	42 9 6	
IV	340	602	74 14 10	23 7 0	
V	387	687	84 12 0	33 4 2	
VI	380	650	82 10 7	31 2 9	
VII	413	757	91 3 5	39 11 7	
VIII	389	709	85 7 8	33 15 10	

Series D.—As this is the first year of the experiment, no conclusion can be drawn, but I offer the following remarks. Bone-dust has failed. Farm-yard manure (40 lbs. nitrogen) gives us the best results (nearly double the unmanured plot). Poudrette has also given fairly good results. The plot top-dressed with saltpetre (20 lbs. nitrogen per acre) gives better results than those in which saltpetre was applied at the time of sowing. The plot manured with saltpetre containing 40 lbs. nitrogen per acre has not given as good a yield as the plot top-dressed with half that quantity. This may be because plots VI and VII were manured with saltpetre at the time of sowing, and therefore it is most probable that before the plants could make use of it, the material, being very soluble, was wasted by surface wash and underground drainage. All nitrates are thus affected. From the above it would seem that top-dressing is more advantageous to the kharif crops, while from the remarks upon the A and B Series it would appear that drilling with seed gives better results in rabi fields. This series is to test the effects of different manures on cotton and juar-tur in rotation, but it is too early to pass any remarks upon rotation, since this is the first year in which the series was started.

SERIES J. SUBJECT.—Manures on juar with subordinate crop tur continuously without rotation.

Plot I.—Area '20 acre. Manured with saltpetre (20 lbs. nitrogen per acre drilled).

„ II.— „ '20 „ Unmanured.

„ III.— „ '20 „ Manured with cattle-dung (20 lbs, nitrogen per acre drilled).

„ IV.— „ '20 „ Manured with saltpetre (20 lbs. nitrogen per acre top-dressed).

Crop—juar-tur.

Number of plot.	Crop.	Outturn per acre.		Value.
		Grain.	Stalks or fodder.	
		lbs.	lbs.	Rs. a. p.
I ...	Juar ...	519	3,926	64 10 4
	Tur ...	252	3,051	
II ...	Juar ...	382	2,633	52 2 8
	Tur ...	335	3,046	
III ...	Juar ...	582	3,555	55 1 8
	Tur ...	175	2,907	
IV ...	Juar ...	567	3,280	56 7 7
	Tur ...	146	3,104	

Series J.—Here we have a continuous mixed crop of cereal and legume. I am very sorry to note that in the year under report the proportion of 6 lines of juar to 2 lines of tur was reversed through an error instead of 6 lines of tur to 2 lines of juar. This year's results will, therefore, be discarded. I may also add that the attacks of cater-pillars played a prominent part in contributing to the inconsistent result.

IV.—EXPERIMENTS WITH TILLAGE.

SERIES E. SUBJECT.—Effect of tillage to various depths on irrigated wheat grown continuously.

Plot I.—Area ·25 acre. Scarified every year.
„ II.— „ ·25 „ Ploughed once with country plough and scarified.
„ III.— „ ·25 „ Ploughed with Swedish plough and scarified.

Plots manured with farm-yard manure containing 40 lbs. nitrogen in year under report.

Crop—wheat (*haura*)—Nagpur. Plots not irrigated.

No. of plot.	OUTTURN PER ACRE.								Remarks.
	1900-01.		1901-02.		1902-03.				
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Value.	Gain in value on plot No. 1.	
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	
I	361	627	259	574	751	801	33 6 7	...	
II	458	590	277	598	789	914	34 14 5	+1 7 10	
III	529	925	317	650	935	1,233	41 14 7	+7 0 2	

The plot ploughed with the Swedish plough has given the best results. It is satisfactory to notice that the people have begun to appreciate its value. At first it was made entirely of iron and cost Rs. 23, but now owing to the beam and stilts being made of wood its price is reduced to Rs. 16. All the three years' results agree in showing that deep ploughing is profitable. The difference between the outturns of plots I and II is, however, very small.

V.—EXPERIMENTS WITH ROTATION AND MIXTURES OF CROPS.

SERIES F. SUBJECT.—Effect of rotation of rabi crops with regular irrigation.

Plot I.—Area ·17 acre. Wheat every year.
„ II.— „ ·17 „ Wheat and lakh alternately.
„ III.— „ ·17 „ Wheat and gram alternately.
„ IV.— „ ·17 „ Wheat and gram (mixed) every year.
„ V.— „ ·17 „ Wheat with subordinate rows of safflower every year.
„ IV.— „ ·17 „ Wheat and sessamum alternately.

Plots manured with light dressing of farm-yard manure containing 40 lbs. nitrogen per acre.

No irrigation in year under report.

For cropping see column 2 below.

No. of plot.	Crop.	OUTTURN PER ACRE.		Value.
		Grain.	Straw.	
		lbs.	lbs.	Rs. a. p.
I ...	Wheat ...	778	893	34 6 2
II ...	Do. ...	899	1,112	40 0 6
III ...	Do. ...	885	1,115	39 7 9
IV ...	Wheat ...	368	526	27 13 0
	Gram ...	238	838	
V ...	Wheat ...	512	1,164	42 11 10
	Safflower ...	804	2,314	
VI ...	Wheat ...	679	1,057	31 0 6

SERIES G. SUBJECT.—Dry crop rotations with wheat.

Plot I.—Area ·29 acre. Wheat every year.
„ II.— „ ·29 „ Wheat and lakh alternately.
„ III.— „ ·29 „ Wheat and gram alternately.
„ IV.— „ ·29 „ Wheat and gram (mixed) every year.
„ V.— „ ·29 „ Wheat with subordinate rows of safflower every year.
„ VI.— „ ·29 „ Wheat and sessamum alternately.

Plots manured lightly with farm-yard manure containing 40 lbs. nitrogen.

For cropping see column 2 below.

No. of plot.	Crop.	Outturn per acre.		Value.
		Grain.	Straw.	
		lbs.	lbs.	Rs. a. p.
I	Wheat	732	1,254	33 13 11
II	Do.	814	1,310	37 5 8
III	Do.	810	1,209	23 1 0
IV	Wheat	306	469	29 5 0
	Gram	366	706	
V	Wheat	336	471	27 2 7
	Safflower	532	1,785	
VI	Wheat	712	1,081	32 7 0

Series G is the duplicate of Series H, the difference being that the former receives regular irrigation whilst the latter is unirrigated.

The land which has been brought under these series was previously receiving quite different treatment, and the effects of such treatment have not yet passed away. No conclusions can consequently be drawn. The gram in both the series was damaged to a considerable extent by cater-pillars. The mixture of wheat and gram was sown in the proportion of 2 of the former to 1 of the latter, and in the fifth plot we had 6 lines of wheat to 2 lines of safflower. Cultivators in the wheat district generally rotate their wheat with lentil (masur) gram or teora. The rotation of a cereal after a papilionacious legume is quite reasonable. In most places they grow birra (wheat and gram mixed) to safeguard themselves against a precarious season, which if it turns out bad for wheat may still be good enough for gram and *vice versa*. Here also we have got a combination of plants of quite different nature. One utilizes the deeper stores of soil while the other feeds on the surface. It is quite possible that the wheat also can utilize the free nitrogen drawn from the atmosphere by roots of gram.

SERIES H. SUBJECT.—Rotation coriander and linseed.

Plot I.—Area ·30 acre. Coriander and linseed alternately.
„ II.— „ ·30 „ Linseed and coriander alternately.

Plots manured with light dressing of farm-yard manure in year under report.

No irrigation in year under report.

For cropping see column 2 below.

No. of plot.	Crop.	Outturn per acre.		Value of produce.
		Seed.	Stalks.	
		lbs.	lbs.	Rs. a. p.
I	Coriander	657	647	18 12 7
II	Linseed	710	1,454	51 11 8

Series G.—Linseed in rotation with ordinary rabi crops fails after a few years. The cultivators of this district believe that linseed will continue to grow well in rotation with coriander and hence the experiment is being tried. Linseed if grown continuously on the same field favours the growth of a weed, called *Talap*, which has the same effect on this crop as *Agia* has on sugarcane. Juar is also greatly affected by *Talap*. Cultivators sometimes sow coriander along with juar and it is said that the former checks the growth of *Talap*. It may thus be tried whether coriander in rotation with linseed will keep down *Talap*. This is the first year of the experiment, and at present nothing definite can be known. To this series I would like to add one more plot which will grow linseed continuously, and then only we will be able to compare the results of this plot with those already in existence. This year the price of the coriander was very low, and consequently the first plot has been valued very low. But the outturn on the whole is good in both the plots.

SERIES I. SUBJECT.—Rotation experiments with kharif crops.

Plot I.—Area ·20 acre. Cotton-tur every year.
„ II.— „ ·20 „ Cotton-tur and juar alternately.
„ III.— „ ·20 „ Cotton-tur and sesamum alternately.
„ IV.— „ ·20 „ Cotton every year.
„ V.— „ ·20 „ Cotton-juar and *sun* as fibre crop alternately.
„ VI.— „ ·20 „ Cotton and juar alternately.
„ VII.— „ ·20 „ Cotton-juar and wheat alternately.
„ VIII.— „ ·20 „ Cotton-juar and gram alternately.
„ IX.— „ ·20 „ Cotton-juar, wheat and gram (mixed) alternately.

Plots manured lightly with farm-yard manure containing 40lbs. nitrogen in the year under report.

For cropping see column 3 below.

No. of plot.	Crop.	Outturn per acre.		Value.
		Grain or lint.	Straw or seed.	
		lbs.	lbs.	Rs. a. p.
I	Cotton	343	613	91 7 2
	Tur	385	1,330	
II	Cotton	208	372	65 13 4
	Tur	495	1,395	
III	Cotton	228	409	61 13 0
	Tur	285	820	
IV	Cotton	275	508	60 5 8
V	Cotton	121	208	69 15 9
	Juar	563	3,115	
VI	Cotton	213	389	46 13 3
VII	Cotton	67	117	52 0 1
	Juar	472	2,726	
VIII	Cotton	77	136	60 5 8
	Juar	501	3,314	
IX	Cotton	102	177	64 10 4
	Juar	524	3,105	

This is a new series devoted to rotation experiments. There was a marked difference in value of plots 1 and 2, though they were side by side and bore the same crop. This is due to their having received different treatment before they were included in this series. In two or three years we hope that the condition of the plots will be level enough to give definite results.

VI.—VARIETY OF CROPS.

10. The remarks on the different varieties of crops grown on the farm are given below.

(*a*) The awned variety of bajra which has been grown successfully on the farm for the last three years is worthy of recommendation. The variety produces larger heads with larger and sweeter grains. Besides the presence of awns prevents the birds from attacking the crop. The seed was distributed to Deputy Commissioners for trial and the general report about it has been fairly satisfactory. Some seed has again been sent to some districts to be tried in the current season. One should be careful to sow this variety far away from the local varieties so that there may be no chance of cross fertilization ; otherwise the variety may lose its awned character.

(*b*) Sorghums (amber and collier) are the best fodder crops. They come to maturity earlier, and hence a crop of gram or teora can be grown after the crop is harvested. It produces a good crop of fine stalks which is liked by cattle better than juar stalks. But if at the flowering time, the stage at which all the fodder crops should be cut, there are rains, it is best to turn the crop into ensilage. In rabi tracts the cultivators will be able to produce a good deal of fine fodder for their cattle if they only sow sorghum in the month of June and then sow their usual crop of gram on the same land after the sorghum is harvested.

(*c*) *Juars.*—Besides the *ganeri* and *halki* varieties of juar usually grown on the farm, 57 varieties of juar received from other districts were also grown for the purpose of testing their quality. From these varieties botanical specimens were also collected. These varieties will again be tried in the current season along with the 50 varieties received from the office of the Inspector-General of Agriculture. From amongst the varieties grown last year it would seem that a variety known as *Saoner* is equal, if not superior, to *ganeri.* We have given it an extended trial during the current year.

(*d*) *Cottons.*—The varieties of cotton grown on the farm are Jari, Bani, Nimari, Upland Georgian, Egyptian and Sea Island.

Sea Island cotton was growing throughout the year under report and the plants also branched freely, but we had to wait for the first picking full 18 months after sowing when we got a very light yield of 40 lbs. per acre. The plants have now been pruned and allowed to grow. They are looking very bushy at present. For the present it is worth noting that the cotton is of good quality. The variety is perennial, and on this account it should save something as regards the labour of cultivating the field and the cost of seed, but the yield has yet to be tested. Samples of the different cottons were sent for valuation to the Manager, Empress Mills, Nagpur, whose opinion and valuation is reported below :—

Upland Georgian.—Fibre longer than bani. Greater portion strong, rest very weak. Price same as Hinghanghat bani, *i. e.*, Rs. 93 per boja of 345 lbs.

Nimari.—Fibre long and strong as Hinganghat but discoloured. Price same as Hinghanghat, *i. e.*, Rs. 93 per boja.

Jari.—Fibre very short and very weak. Price Rs. 5 less than Nagpur jari ginned, *i. e.*, Rs. 71.

Egyptian-cotton—Staple very good and its length is over $1\frac{1}{4}''$ and is strong. It is silky and soft to the touch, colour white, but there are many yellow spots. Price Rs. 150 per boja of 345 lbs. ($1\frac{1}{2}$ times that of Hinganghat).

Bani.—Staple of average length and strong and is just like Hinganghat cotton in this respect; but in colour it is slightly blackish. Price Rs. 96-8-0 per boja of 345 lbs.

Garohill.—Staple very short and is worse than jari and is unfit for our work. Colour white. Price Rs. 66 per boja of 345 lbs.

The Upland Georgian cotton which is acclimatized on the farm is proving itself a good variety. In the year under report its outturn per acre was 500 lbs. This year we are going to give it a more extended trial. If it gives a good outturn, there seems no reason why seed should not be distributed. The quality of lint of this variety is, if not superior, at least equal to that of Bani.

11. Besides the above varieties a collection of all the varieties grown in the Central Provinces was made, and these were grown in lines side by side with those received from the different parts of India through the Inspector-General of Agriculture, who advised that a regular scheme of cross-fertilization should be started to improve the quality of the local cottons. For these experiments a plot was reserved in which 93 varieties were sown; out of these 12 were from Bombay, 9 from Assam, 10 from Bengal, 16 from the

Punjab, 6 from the United Provinces, 12 from the Central Provinces and 27 from America. Most of the indigenous varieties germinated and grew well, but the American exotics though they were far ahead in the beginning suffered from excessive rain in the month of August and began to show a sickly appearance. They, however, produced some bolls and gave sufficient acclimatized seeds to be sown and tried in the current season. Last year's seeds were received fresh from America through the Inspector-General of Agriculture and this may be one reason why they suffered from excessive moisture. The acclimatized Upland Georgian which was also grown along with them thrived all through very nicely.

From all these varieties those that showed the most promise were selected for crossing. From these some 85 bolls of 39 different crosses were obtained. The description of the crosses with the names of the parents is given in the statement below:—

Statement showing the various crosses of cotton produced on the farm.

Serial No.	Female.	Male.	Serial No.	Female.	Male.
1	Goghari (Bombay) ...	Kumpta (Bombay)	23	Jari (Central Provinces).	Bani (Central Provinces).
2	Do. ...	Kanbi Do. ...			
3	Do. ...	Sultanpur (United Provinces.)	24	Do. ...	Nimari do.
			25	Do. ...	Kil (Assam).
4	Do. ...	Jari (Central Provinces)...	26	Do. ...	Egyptian (Egypt).
5	Do. ...	Koati (Bengal) ...	27	Do. ...	Garohill (Central Provinces.)
6	Do. ...	Deshi Lahore (Punjab) ...			
7	Kumpta (Bombay) ...	Broach Deshi (Bombay) ...	28	Bani (Central Provinces).	Kil (Assam).
8	Do. ...	Goghari (Bombay) ...			
9	Motomathia (Bombay) ...	Red Punjab (Punjab) ...	29	Do. ...	Deshi Lahore (Punjab).
10	Mathia (Bombay) ...	Bani (Central Provinces),	30	Do. ...	Haldia (Bengal).
11	Kanbi (Bombay) ...	Goghari (Bombay) ...	31	Do. ...	Mathia (Bombay).
12	Broach Deshi (Bombay)...	Kumpta (Bombay) ...	32	Do. ...	Deshi Aligarh (United Provinces).
13	Do. do. ...	Jari (Central Provinces)...			
14	Do. do. ...	Kanbi (Bombay) ...	33	Do. ...	Texas big boll (America).
15	Broach Deshi (Bombay) ..	Haldia (Bengal) ...	34	Do. ...	Griffin (America).
16	Deshi Lahore (Punjab) ...	Bani (Central Provinces)...	35	Upland Georgian, acclimatized (Central Provinces).	Egyptian (Egypt).
17	Khako (Punjab) ...	Egyptian (Egypt) ...			
18	Deshi Lahore (Punjab) ...	Goghari (Bombay) ...			
19	Do do. ...	Broach Deshi (Bombay)...	36	Do. ...	Gondole (America).
20	Wagad (Bombay) ...	Goghari (Bombay) ...	37	Do. ...	Khaki (Punjab).
21	Do. ...	Broach Deshi (Bombay) ...	38	Haldia (Bengal) ...	Bani (Central Provinces).
22	Deshi Aligarh (United Provinces).	Bani (Central Provinces)	39	Kil (Assam) ...	Do. do.

12. *Maize.*—Jaunpur and five American varieties, namely, Horsetooth, Extra Early, Waterloo, Hickery King, Field Corn, King Phillips and White Flint were tried. The Americans did not give satisfactory results while the cultivation of Jaunpur maize was successful, producing well set big cobs with plump, sweet and nutritious grains. During the year under report, at the instance of the Director of Agriculture, seed of this variety was sent to all district gardens where it is generally reported to have done well. All the Superintendents of these gardens promise to give it a further trial during the current season. 150 lbs. of seed produced on the farm together with 250 lbs. obtained from the United Provinces has been also distributed by the Director of Agriculture to members of the District Agricultural Associations and to selected cultivators. It may be worth mentioning here that the green stalks after removing the ripe cobs form excellent material for ensilage. Maize stalks are not at present utilized by cultivators in the Central Provinces.

13. *Paspalum dilatatum.*—This grass which is said to be drought resistant has not yet proved so on the farm. It was sown in the month of June in a lowlying piece of land commanded by irrigation. The germination was good and the plants tillered freely forming large clumps. The crop was kept clean by hand weeding. It gave four cuttings during the year under report. It was helped by four waterings in the dry months. It is allowed to grow in the same area during the current season. For the present it is doing well and gives a cutting fortnightly. Some seed collected on the farm was sent to the Superintendent of Jail, Basim. I have not yet received any report from him of the result of his trial.

14. *Rice.*—During the year we had five varieties of rice on the farm. Two of these, *halki* and *chinoor*, have been grown for a long time on the farm. Three more varieties *safeda*, *begma* and *soon* were secured from the Punjab. They were transplanted in small plots and have given good yields. All the three varieties matured much earlier than *chinoor*, which is a late fine rice. *Begma* and *soon* can be classed amongst the finer sorts, while *safeda* though not so fine is much more productive. We are giving them an extended trial in the current season to see if they are really worth introducing in the districts. *Safeda* giving a moderately good quality of rice and a large outturn shows promise of success.

15. Tur (*Arhar*) "*Cajanus Indicus.*"—Two new varieties of tur were obtained. One was brought by the Assistant Director of Agriculture from Bilaspur and the other was received through the Inspector-General of Agriculture from the United Provinces. The Bilaspur tur has very large seeds and the leaves, &c., of these plants are also much bigger than those of the ordinary tur. The United Provinces tur has also been successful. The plants were very bushy. Both have been sown on a larger scale in the current year.

16. *Big seeded chauli*—"*Vigna Catiang.*"—This variety of *Vigna Catiang* was received from Sambalpur. The seed is much bigger and of better quality than the local ones. 60 lbs. of seed have been distributed in the districts for experimental cultivation.

17. *Ground-nut.*—A trial was made of a Madras variety, brought by Mr. Joshi from Madras, when he had been there in connection with irrigation. The variety has well filled pods which gave an early and large crop.

18. *Rala.*—Mr. Joshi also brought with him from Madras two varieties of *rala* (red and white). Both grew successfully on the farm and the seed collected has been sent to Sambalpur, Balaghat and Bhandara for trial.

19. *Ensilage.*—The system of preserving green fodder was tried in two ways—

I. *The closed silo.*—We began filling this silo in the month of August with the juar stalks which we got at the time of thinning. The filling up of the silo was continued for about a month because we found daily that the stuff had sunk a good deal. In the month of September the filling was completed with chopped maize stalks. This layer also ensured the compactness of the silo because the stuff so cut presses closely together. This year we mean to fill the closed silo only with material which is cut into small pieces.

II. *The open silo.*—It was mentioned in last year's report that the smaller the size of the open silo the more is the wastage, while if we increase the size of the silo the proportion of wastage will be reduced proportionately. Accordingly the size of the silo was doubled during the year under report. The wastage all around was the same as in last year's silo, so that there was a decided gain in making a large silo. The exposed portion of the fodder rotted, but in the month of May excellent material was obtained from inside. It was greatly relished by bullocks in the scorching days of summer.

VII.—INVESTIGATION OF PLANT DISEASES.

20. *Smut in Juar.*—The treatment of juar seed with a solution of copper sulphate has continued to prove a most effective remedy against smut.

Wheat rusts.—During the year under report efforts have been made to start the breeding of wheat on more definite lines. A cross of *mundia pissi* and *houra* has already come into prominence by its good milling and rust-resisting qualities. In order to start other experiments samples of the different varieties of wheat grown in the Provinces were collected. To this list were also added those of other Provinces, which were kindly supplied by the Inspector-General of Agriculture, and the Australian wheats which we have been growing on the farm for the last three years. We received also three varieties of Russian wheat from the Director of Agriculture, United Provinces, but these were found very poor throughout. In all 153 varieties were tried, *viz.* 48 from the Central Provinces, 60 from other Provinces, 42 from Australia and 3 from Russia.

In the month of January the appearance of yellowish spots upon the leaves of some varieties gave rise to the suspicion of the prevalence of rust. In order to remove our doubts, samples of such plants were sent to the Cryptogamic Botanist who reported as follows:—

Copy of letter No. 223-XVIII, dated the 26th February 1903, from Doctor Butler—

With reference to specimens of wheat received for examination with your letter dated the 23rd January 1903, and suspected to show rust, I have the honour to state that the examination of the specimens taken as a sample show no evidences of rust. It is however necessary to mention that it is not possible to detect rust within the tissues of the plants except immediately previous to the external appearance of the yellow or brown pustules. It is in fact not known with certainty whence rust arises, and it is possible that it is present in the plant from the seed in an invisible condition and breaks out only when circumstances become favourable. Whether this be true or not we have certainly no way at present of determining if a plant be rusted earlier than a day or two before the appearance of pustules.

The real rust, however, made its appearance in the month of February when the plants had already passed the critical stage, because by this time most of the grain had already set. It is worth mentioning here that the varieties which may be rust-resistant in one Province may not be so in another. For instance spelt wheat which is believed to be rust proof in the Bombay Presidency was badly affected with it here. Then again some varieties which the Inspector-General of Agriculture found unaffected here were affected at Poona. From amongst the 150 varieties grown only those intended to serve our definite object were selected for crossing. The statement below shows the

crosses produced. Columns 1 and 2 show the names of the parents while columns 3 and 4 show the number of flowers tried and the success obtained :—

No.	Name of mother.	Name of father.	Number of flowers tried.	Number of grains obtained.
1	Bansi (Cental Provinces) ...	Khapli (Bombay) ...	60	21
2	Do. do. ...	Haura (Central Provinces) ...	60	18
3	Bangasia do. ...	Poptia (Bombay) ...	60	9
4	Do. do. ...	Haura (Central Provinces) ...	24	3
5	Haura do. ...	Khapli (Bombay) ...	132	16
6	Do do. ...	Bansi (Central Provinces) ...	12	1
7	Khapli (Bombay) ...	Do. do. ...	72	44
8	Do. do. ...	Jalalia do. ...	48	26
9	Do. do. ...	Bangasia do. ...	84	21
10	Do. do. ...	Haura do. ...	60	19
11	Jabalpur pissi (Central Provinces)...	Khapli (Bombay) ...	48	1
12	Do. do. do. ...	Daudkhani A (Bombay) ...	96	57
13	Do. do. do. ...	Do. (Central Provinces)...	24	11
14	Hybrid Farm (Central Provinces) ...	Do. A (Bombay) ...	120	54
15	Do. do. do. ...	Nagpur pissi (Central Provinces) ...	108	59
16	Dandikhani A (Bombay) ...	Hybrid Farm do. ...	132	76
17	Do. (Central Provinces).	Poptia (Bombay) ...	24	10
18	Jalalia do. ...	Khapli do. ...	84	13
19	Lal pissi do. ...	Do. do. ...	72	20
20	Nagpur pissi do. ...	Daudkhani A (Bombay) ...	120	45
21	Do. do. do. ...	Hybrid Farm (Central Provinces)...	108	51
22	Mundi pissi do. ...	Daudkhani do. ...	60	9
23	Ekdania do. ...	Hybrid Farm do. ...	48	52

21. *Linseed rust.*—In a lowlying plot of linseed this rust was detected. It made its appearance in scarlet spots upon the surface of leaves and stems. Samples of attacked linseed plants representing the disease in all stages were sent to the Cryptogamic Botanist. He reported that the disease was *melampsora lini*, a fungus having no connection with any of those causing the various cereal and other rusts in India.

22. *Cotton disease.*—In the month of January a disease was also noticed in the Sea Island cotton. Firstly red patches appeared on them and then the plants began to wilt. Samples of these were also sent to Dr. Butler who writes thus about the nature of these diseases.

Copy of letter No. 266—VI-2, dated the 20th March 1903, from Doctor Butler—

With reference to two plants of Sea Island cotton said to be suffering from disease sent to me with your letter No. 1 of 1903, I have the honour to state that the disease appears to be of an obscure nature, no cause having been made out on examination. The nearest approach to the condition of plants sent, which I have been able to find in the literature of cotton diseases, is a condition described by Mr. David in Egypt. The chief symptom of the disease is a reddening of areas on the leaf accompanied by a modification of the glands characterised by a production of a resinous substance in the cells. Mr. David attributes the condition to the dense ground-fogs habitual in Egypt before the harvest, but I doubt if the explanation be sufficient, as most diseased conditions attributed at one time or another have been found on further investigation to be due to other causes.

23. *Disease in Tur (Cajanus Indicus).*—It has been observed on the farm that if tur is grown in the same plot on the farm for a number of years the soil gets what may properly be termed tur sickness. The plants grow well till they are 18" to 24" high, when suddenly we find some plants wilting and then gradually other plants also suffer the same fate till nearly the whole plot is destroyed. The wilting spreads from below upwards, that is, the lower portion of the plant is affected first and then the affection spreads to the top. In order to investigate the nature of this disease Dr. Butler, the Cryptogamic Botanist, visited the farm and declared that the disease is caused by a fungus which chokes the vessels. He made some technical experiments in order to ascertain how the disease spreads from plant to plant. The subject is still under investigation and we hope that it will be worked out in the current year.

24. *Trials of other fungicides.*—Copper sulphate solution with a strength of ½ per cent. was tried to see its effects on juar smut. No heads were attacked with smut. The solution which we use is about 13 per cent. strength, but the difference in our treatment is that we rub the seeds while the solution is being poured on it and therefore only a bottle is sufficient for 40lbs. seed. With a ½ per cent. solution we have to keep the seeds steeped in the solution for 5 minutes and this process requires a larger quantity of solution for the same weight of seed. The other fungicides which were tried for smut in wheat are sodium sulphide, potassium

sulphide, copper sulphate ½ per cent. solution and hot water (135° to 145° F.). The table below shows the effects of different fungicides on the germination of seed. The seeds tried in each case were 100 :—

Name of fungicide.	Strength of solution.	Time of immersion.	No. of seed germinated in 100.
Sodium sulphide ...	½ per cent.	24 hours	60
Potassium sulphide ...	½ "	24 "	62
Copper sulphate ...	½ "	5 minutes	71
Hot water ...	Bet 137°— 142° F.	5 "	54
Untreated ...	...	...	94

From the above it is clear that the germinating power of a considerable percentage of seed is destroyed by these treatments. There was no smut in wheat during the season, and the results therefore are not yet conclusive. The experiments will be tried again in the next season.

VIII.—TRIAL OF IMPLEMENTS.

24. Under this heading I may give a copy of the statement which the Director of Agriculture, Central Provinces, issued with his Circular letter No. 992-120, dated the 6th March 1902, to the Secretaries of District Councils. In this letter the Director suggested that the District Councils may do some good if they distribute as prizes to cultivators the implements recommended. This table describes some useful implements with their merits and costs :—

Serial No.	Name of Implement.	Special advantages.	Full price at Nagpur.
			Rs.
1	Swedish plough ...	An excellent iron-plough for ploughing land deeply and turning over the soil. Works well in black soil, and is not too heavy for use by ordinary plough-cattle. Specially recommended for rabi, cotton and juar tracts.	16
2	Harder's Fodder-cutter and Shredder.	A most useful American machine for cutting juar stalks and other fodder into short bits, which cattle eat with great ease and with no waste, resulting in much saving of fodder : can be worked by hand-power. A man working at the machine for half a day can chop fodder for 30 head of cattle. Is also most useful for cutting up green fodder for preparation into ensilage. Strongly recommended for juar tracts.	215
3	Marvin-Smith's Fodder-chopper.	A little implement which chops up fodder stalks by hand-power. Suitable for a small cultivator in a juar tract.	12
4	Poona 3-roller iron Sugar-mill.	The most efficient sugarcane-crushing mill : is made exactly on the same principle as the indigenous wooden mill : is simple in construction and very strong. Works more rapidly than the wooden-mill and extracts the maximum amount of juice. Strongly recommended for sugarcane tracts.	160
5	Poona evaporating Sugar-pan.	A shallow iron pan of improved shape in which the maximum amount of gur can be prepared from sugarcane juice. Made of good sheet-iron, strongly rivetted, which lasts a long time. Strongly recommended for sugarcane tracts.	30
6	Harder's Fanning-mill	A good machine for winnowing all varieties of grain. Easily worked by hand, and gives a large outturn : separates grain from all bhusa and dirt. Its use allows a cultivator to winnow grain every day whether there is a breeze or not. Recommended for all districts.	136
7	Marvin-Smith's Corn-sheller.	A useful little implement for shelling maize cobs. It removes all grain from maize cobs without injuring the grain. Suitable for districts where maize is commonly grown.	10
8	Hand sieve ...	A useful article for cleaning grain and for separating good grain required for sowing purposes. The mesh of the sieve requires to be of different sizes for different kinds of grain, so that the variety of grain for which it is most required should be stated.	2
9	Marvin-Smith's Round-about gear, two-bullock power.	A very good round-about gear to be worked by two bullocks, which will give the necessary power to work all kinds of agricultural machinery.	210
10	MacCarthy Cotton gin.	An excellent machine for ginning cotton (separating the seed from the lint) worked by hand-power. The seed is not injured, so that it can be used for sowing. Recommended for cotton tracts.	220
11	Sickle ...	A sickle of English shape, a much better implement than the ordinary native "hasia" or "darati."	2
12	Tifan ...	A three-line seed-drill used in the Nagpur country. Sows three lines of seed at the same time. Suitable for districts where this implement is at present unknown.	12
13	Mayfurth's Hand-thresher.	A hand-power threshing machine, which will thresh any sort of grain, except juar, maize and the like.	126

All these implements have been tried on the farm and elsewhere, and have given satisfaction.

25. Besides the above the following new implements were also tried during the year under report :—

Kent's corn planter and segment corn planter.——Both of these serve the same purpose, but the latter is the better. They are very useful for dibbling the seeds of crops. The dropping of seeds is regulated by a very simple contrivance which can be regulated for different sizes of seeds. The Assistant Superintendent, Government Farm, Poona, and Mr. Ruchiram of Lahore College were supplied each with half a dozen of these dibblers. The cost of a dibbler is Rs. 5.

26. *Mathew's seed drill, hoe, plough and rake combined.*—This is a machine which gives satisfactory work in vegetable gardens. It can be easily fitted to plough, sow, hoe and rake. It is worked by manual labour, and two men can work it with great convenience. The machine costs Rs. 35.

27. *Marvin-Smith's four-horse power round-about bullock-gear.*—It is exactly the same pattern as the one mentioned in the above table. The only difference is that owing to its greater size the power is greater, so that more powerful machines can be worked. The two-horse power gear is the best to work ordinary agricultural machinery. In India two good bullocks can be used instead of two horses. The cost of the machine is Rs. 320. Raghoba Ratiram of Saoner, Seth Narsinghdass of Mohgaon and the Municipal Committee, Nagpur, ordered the four-horse power gears, and with these they work fodder-cutters, cotton-gins, &c.

28. *Bucket pump.*—A spraying implement which gives a fine spray which is very useful for spraying fruit trees with insecticides and fungicides. Its price is Rs. 10.

29. *Perfection sprayer* is a very cheap contrivance for spraying small plants. It is economical and the work is very satisfactory. It costs only Rs. 2-8-0.

30. *Granger seeder.*—This is a machine for broad-cast sowing. A man working with it has to walk at a regular pace in a straight line, and while doing so he will sow up to the distance of about 15 feet on each side according to the density of the seed. If the seed is heavier, it will be thrown to a greater distance while the lighter seed falls at a less distance. A novice with a little practice will be able to sow evenly. The cost is Rs. 10.

31. *A turn-wrest plough from Messrs. H. Cook and Sons* was received through the Director of Agriculture, Central Provinces. This plough has worked very satisfactorily. It could break ¾ths of an acre of waste land at Telenkheri in one day during the hot season. Two pairs of bullocks are required to work it when the ground is hard, but one good pair can work it during the monsoon. It cuts very clean furrows. Since the mould board can be turned on both sides, its working is like the country plough which ploughs continuously furrow after furrow; the Swedish plough can only plough a field in different sections by going round each section.

IX.—DISTRIBUTION OF SEEDS AND IMPLEMENTS.

Seeds and implements.

32. During the year under report seeds and implements supplied are given in the table below :—

Name of seeds.	Quantity supplied to		
	District and other Government officers.	Private persons.	Demonstration Farms.
	lbs.	lbs.	lbs.
Cotton (Jari)	...	2,603	875
Do. (Nimari)	...	20	...
Do. (Upland Georgian)	...	6	...
Do. (Egyptian)	1½	63	16
Juar (Ganeri)	5	1,631	1,468
Do. (Early)	...	1,022	...
Do. (Motitura)	11	443	...
Do. (Dharwar)	...	2	...
Paddy (Chinoor)	60	100	...
Do. (Early)	555	65	...
Tur	...	502	...
Bajra (awned)	375	8	...
Maize	19	17	60
Sorghum	24	15	...

Name of seeds.	Quantity supplied to		
	District and other Government officers.	Private persons,	Demonstration Farms.
	lbs.	lbs.	lbs.
Popat	100	...	...
Ambari	...	30	...
Sar	24	...	...
Paspalum dilatatum	1	...	...
Wheat (Haura)	100	65	...
Do. (Pissi)	...	1	...
Do. (Bansi)	...	10	...
Do. (Jalalia)	...	10	...
Do. (Jondhala)	...	50	...
Do. (Hybrid)	50	12	...
Linseed	...	102	...
Gram	...	40	...
Winter til	...	905	100
Castor	8	...	...
Safflower seed	...	1	...
Peas	...	13	...
Implements.			
Swedish plough	4	7	...
Corn sheller	...	1	...
Seed dibblers	6	6	...
Oilcake crushers	...	1	...
Bullock gears	...	3	...
Bakhar	...	4	1
Argarha	...	5	1
Daura	...	4	1
Dundia	...	4	1

X.—CATTLE BREEDING FARM.

33. The Cattle Breeding Farm at Telenkheri has been started to improve the Arvi breed of agricultural cattle and to supply good bulls to cultivators.

34. The site selected is on the brow of Telenkheri hill which commands the Phutala tank. The advantages of the place are that there is a good water-supply in the tank and that there is fairly good grazing along the edge of the tank even in the hot weather. The sheds are built in the form of a quadrangle, but one side is left open to extend the two wings in case of necessity when the stock increases. The farm was started on the 10th of October when 34 cows were bought from the Jaitpur herd. The founder of this herd was Ranoji Naik, a well-known cattle breeder. Out of these 34 cows 12 were with calves at foot. Up to date on our farm 19 cows have given birth to calves of which 11 are males and 8 females. The bull was purchased from Arvi from the herd of Mr. Gulam Mustafa of Waigaon.

35. The cows belong to the breed locally termed *gaolao*. Pure white is the prevailing colour; only in some we find that the white is replaced by light fawn about the head and shoulders. The well shaped frame stands on well set legs. The long narrow neck supports an elongated head with prominently convex forehead, beautiful dark eyes and small horns. The dewlap and the skin near the navel are well developed. The tail which is long tapers finely and at its end carries a tuft of dark hair. The udders of most are well set with nice teats. It is not intended to develop the milking qualities of the breed, because our sole object is to produce good calves which must get the full quantity of milk.

The total cost of starting the farm and of its maintenance during the year under report is:—

	Rs. a. p.
Purchase of cows and bull	1,460 0 0
Construction of cattle shed	1,023 8 6
Pay of the graziers	47 4 9
Feed and care of cattle	78 11 0
Total ...	2,609 8 3

XI.—FODDER AND FOREST RESERVES.

Fodder and forest reserves.

36. The Farm and Gardens continue to draw their supply of grass from the reserve. The receipts and expenditure of the reserve are as follows:—

Expenditure.

	Rs.
Pay of two Chaukidars in 1902-03	98

Receipts.

(1) Value of grass supplied to Garden	428
(2) Value of grass supplied to Breeding Farm	300
(3) Value of grass supplied to Telinkheri Farm and kept in stock for sale	600
(4) Value of grass sold to the public	717
Total ..	2,039
Deduct cost of establishment ...	98
Net profit ...	1,941

XII.—SEWAGE FARM.

37. The season was favourable for the crops of the Kachi cultivators and they have reaped good harvests in both the seasons. The receipts and expenditure of the Sewage Farm during the year under report are given below:—

Receipts on account of rent including water rate collection in 1902-03.	Expenditure in 1902-03.
Rs. a. p.	Rs. a. p.
1,593 15 0	865 9 3

During the year under report the rental of the Sewage Farm was increased from Rs. 50 to Rs. 75 per acre so that this part of the farm now shows a substantial profit.

XIII.—FINANCIAL RESULTS.

38. The expenditure and receipts of the year on the farm are shown below:—

	Expenditure.			Receipts.	Net cost.
	Salaries.	Contingencies.	Total.		
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Budget	5,576 0 0	5,034 0 0	10,610 0 0	3,500 0 0	7,110 0 0
Actual	3,876 0 10	2,848 12 8	6,724 13 6	5,456 13 9	1,267 15 9

A detailed statement showing the various items of receipts and expenditure is printed as Annexure D.

XIV.—TELINKHERI FARM.

History.

39. The Telinkheri Garden was originally one of the Raja's Gardens and was, after the annexation of the Nagpur country, declared nazul, *i. e.*, the property of the State. The Telinkheri Garden was retained and continued to be managed by the Local Fund Committee until it was handed over to the Forest Department in 1872. In placing the Garden under the management of the Forest Department Sir John Morris, then Chief Commissioner of the Central Provinces, gave that Department a large area attached to the Gardens for the purpose of an experimental plantation.

The Forest Department succeeded in raising a good growth of forest trees on the larger portion of the area reserved for the purpose, keeping a smaller portion for the cultivation of food crops. In later years the Forest Department honeycombed the plantation by bringing under cultivation several plots of land situated in different parts of the plantation.

40. The management of the Telinkheri farm was handed over to the Superintendent, Experimental Farm, on the 1st June 1899. The establishment that has been entertained to work the farm consists of—

	Rs.
1 Overseer	... 30 per mensem.
1 Jamadar	... 6 „
2 Chaukidars	... 6 each „
11 Ploughmen at different rates of pay, *viz.* ...	... 9 and 7 „
Total annual cost of establishment...	1,668

The farm is situated about two miles from Nagpur. The land is very uneven and stony in parts. 75·42 acres are under cultivation, the rest being occupied by forest and grazing lands. The fields are thoroughly drained.

41. The only experiment conducted at Telinkheri Farm was to test the different methods practised in the provinces of cultivating rice. The following table gives the outturn of paddy sown according to the different methods :—

Experiments.

Method of sowing.	Area.	Outturn of paddy per acre.
	Acres.	lbs.
Sown broadcast	·25	824
Sown by seed drill	·27	700
Sown broadcast and then transplanted.	·27	1,100
Sown broadcast but ploughed under locally termed *biyasi*.	·25	910

The land is not yet in a sufficiently good state to render it suitable for experimental purposes.

The areas and outturns of the following crops grown on the farm are given below :—

Name of crops.	Area.	Outturn per acre.
	Acres.	lbs.
Cotton (jari) ...	18·37	698*
Juar ...	13·00	460
Tur ...	7·90	484
Til (rainy) ...	5·85	57
Do (Winter) ...	8·45	80
Paddy .	8·40	481
Linseed ...	6·50	262
Jagni ...	·25	104
Castor ...	3·70	48
Wheat ...	4·45	1,138

* Seed cotton.

It will take some few years to get the land into proper order, and the crops at present are much injured by weeds, especially kans.

42. During the year under report a variety of juar was received from Dharwar. This variety was sown along with paddy in lowlying places and grew successfully in spite of the water-logging. Its outturn is fairly good and the grain is of fair quality. The seed collected has been sent to Sambalpur, Raipur and Bilaspur, so that the cultivators may try it in their paddy fields. If for want of rain the crop of paddy is spoiled, Dharwar juar sown with paddy should give a fair crop.

The following table compares the receipts and expenditure of the year under report with those of last year :—

Year.	RECEIPTS.					EXPENDITURE.							
							CONTINGENCIES.						
	Commercial sale of produce.	Rent of Government land.	Sale of grass	Miscellaneous.	Total.	Establishment.	Purchase of seeds and plants	Purchase of cattle.	Purchase of implements.	Feed and care of cattle.	Miscellaneous.	Total.	Total expenditure.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1901-02.	1,321 5 6	71 0 0	399 5 9	759 10 3	2,551 5 6	945 8 7	...	1,350 0 0	...	172 2 0	149 14 0	1,672 0 0	2,617 8 7
1902-03.	928 7 7	47 0 0	1,557 12 1	464 7 3	2,997 10 11	1,219 3 9	...	...	12 12 0	345 15 6	143 11 0	502 6 6	1,721 10 3

I have the honour to be,

Sir,

Your most obedient Servant,

BHAIYALAL DUBEY,

Superintendent, Government Experimental Farm.

LIST OF ANNEXURES.

A.—Statement showing the total areas under cultivation on the Experimental Farm, Nagpur, during 1902-03.

B.—Statement showing the average rates of the cost of cultivation on the Experimental Farm, Nagpur, during 1902-03.

C.—Statement showing the rates used for valuing the produce of the Experimental Farm, Nagpur, during 1902-03.

D.—Statement showing the comparison of receipt and expenditure of 1902-03 with that of 1901-02.

E.—Programme of experiments as it stood on the 1st June 1903.

Annexure A.

Total Area under Cultivation on the Experimental Farm, Nagpur, during the year 1902-03.

Crops.	Area.	Total.	Grand Total.
	Acres.	Acres.	Acres.
A.—EXPERIMENTAL AREA.			
(1) *Kharif*—			
Cotton alone	2·00		
Cotton and tur	·60		
Cotton and juar	·80		
Juar and tur	·80		
		4·20	
(2) *Rabi*—			
Wheat alone	5·89		
Wheat and gram	·46		
Wheat and safflower	·46		
Coriander	·30		
Linseed	·30		
		7·41	11·61
B.—NON-EXPERIMENTAL AREA.			
(1) *Kharif*—			
Cotton (different varieties)	13·82		
Do. (Egyptian)	·52		
Do. (Sea Island)	·67		
Paddy (Chinoor)	·48		
Do. (Early)	·27		
Juar	6·84		
Tur	11·68		
Sorghum	·75		
Maize	·30		
Popat	1·10		
Bajra	·16		
Rala	·06		
San	1·34		
Ground-nut	·10		
		38·09	
(2) *Rabi*—			
Wheat	8·37		
Linseed	1·46		
Til	4·29		
Peas	·25		
		14·37	52·46
GRAND TOTAL	...	...	64·07

Annexure B.

Statement showing the average cost per acre of each operation of cultivation on the Experimental Farm, Nagpur, during the year 1902-03 *as deduced from the field cultivation book.*

[The hire of a pair of bullocks is taken as 12 annas; of a male cooly 3 annas; of a female cooly 1½ annas and of a child 1 anna.]

Class of operation.	Detail.	Rate per acre. Rs. a. p.	Explanation.
Cost of tillage ...	Ploughing by Swedish plough ...	1 5 9	A pair of bullocks and a man for 1·45 days.
	Hoeing by bakhar (bullock hoe) ...	0 13 3	Do. do. ·89 day.
	Weed hoeing by daura (small bullock weeding hoe).	0 10 1	Do. and 2 men for ·56 day.
	Weed hoeing by dundia (large bullock weeding hoe).	0 8 1	Do. do. ·44 day.
	Weeding by hand... ...	0 10 2	10 women for ·67 day.
Cost of sowing (including cost of seed).	Cotton by argarha (country drill hoe).	0 11 1	16 lbs. of seed (Re. 0-2-7). A pair of bullocks and a man and 3 women for ·43 day.
	Tur by argarha (country drill hoe)...	1 1 9	17 lbs. of seed (Re. 0-12-3). A pair of bullocks and a man and 3 women for ·28 day.
	Juar by tifan (country drill) ...	0 10 1	14 lbs. of seed (Re. 0-7-9). A pair of bullocks and 2 men for ·13 day.
	Gram by nawnagar (drill plough)...	2 4 3	40 lbs. of seed (Re. 1-11-11). A pair of bullocks and 2 men for ·46 day.
	Linseed by tifan (country drill) ...	1 1 4	13 lbs. of seed (Re. 0-12-5). Two pairs of bullocks and 2 men for ·16 day.
	Wheat by nawnagar (drill plough).	6 11 4	100 lbs. of seed (Rs. 5-4-0). One pair of bullocks and 2 men for 1·29 days.
Cost of manure (excluding loading, carting and spreading).	Saltpetre	16 10 0	*240 lbs. at Rs. 5-8-8 per maund.
	Bone-dust	3 6 0	*360 lbs. cost of collecting (Re. 0-8-0) per maund and of crushing (Re. 0-4-0) a maund.
	Cattle-dung	10 0 0	*160 maunds at Re. 0-1-0 per maund.
	Ashes of dung	11 0 8	160 maunds dung (at Re. 0-1-0) per maund and drying and burning dung ashes (Re. 1-0-8) per acre.
	Green-manuring with sun-hemp ...	9 11 10	100 lbs. of seed (Rs. 3-12-0); sowing broadcast (Re. 0-1-8); covering seed by harrow (Re. 0-7-6); and cutting and ploughing (Rs. 5-6-8).
Cost of harvesting.	Picking cotton	1 3 8	2 women for 6·55 days each picking.
	Reaping juar	2 1 2	8 do. for 2·76 days.
	Do. gram	1 4 0	7 do. for 1·90 days.
	Do. linseed	1 0 8	5 do. for 2·22 days.
	Do. wheat	1 0 2	4 do. for 2·69 days.
Cost of threshing and cleaning.	Ginning cotton	4 0 0	2 men and 1 woman for 8·53 days; average produce per acre 521·5 lbs. of seed cotton.
	Threshing and cleaning juar ...	0 6 2	1 man and 1 woman for 1·37 days; average produce per acre 321 lbs. of grain and 1,592 lbs. of karbi.
	Do. do. gram ...	3 2 0	4 bullocks, 1 man, 2 women and 2 boys for 1·56 days; average produce per acre 164 lbs. of grain and 805 lbs. of chaff.
	Do. do. linseed ...	1 15 3	4 bullocks, 1 man, 2 women and 2 boys for ·07 day; average produce per acre 108 lbs. of seed and 375 lbs. of stalks.
	Do. do. wheat ...	2 12 2	4 bullocks, 1 man, 3 women and 2 boys for 1·31 days; average produce per acre 367 lbs. of grain and 400 lbs. of straw.

* During the year under report the rates of manures per acre are as follows:—

Saltpetre	...	340 lbs. per acre.
Bone-dust	...	2,270 " "
Dung	...	4,800 " "

Annexure C.

Statement showing the rates used for valuing the produce of the Experimental Farm, Nagpur, during the year 1902-03.

Name of produce.		Value.		Remarks.
		Rate.	Per.	
		Rs. a. p.		lbs.
Cotton (lint) ...	...	66 0 0	Bojha of ...	345
Cotton seed ...	...	10 0 0	Khandi of ...	640
Juar ...	Grain ...	11 8 0	Do. ...	390
	Karbi ...	30 0 0	Poolas 1,000 about ...	3,460
Tur ...	Grain ...	15 0 0	Khandi of ...	421
	Stalks ...	0 12 0	Eight bundles about ...	560
	Bhusa ...	1 8 0	One cart-load about ...	478
Gram ...	Grain ...	14 0 0	Khandi of ...	390
	Chaff ...	1 8 0	One cart-load about ...	478
Linseed ...	Seed ...	26 0 0	Khandi of ...	385
	Stalks and bhusa ...	1 8 0	One cart-load about ...	478
Wheat (haura) Nagpur ...	Grain ...	16 0 0	Khandi of ...	400
	Straw ...	1 12 0	One cart-load about ...	478

Annexure D.

Statement showing the comparison of Receipts and Expenditure of the Experimental Farm, Nagpur, of 1902-03 *with that of* 1901-02.

Heads.	1901-02.	1902-03.	Remarks.
	Rs. a. p.	Rs. a. p.	
Receipts.			
Commercial sale of produce	1,225 2 9	1,729 7 0	
Distribution ... Seeds	481 7 11	318 10 2	
Distribution ... Implements ...	134 0 0	172 8 0	
Rent of Government land	791 2 7	767 11 7	
Sewage Farm	1,101 8 0	1,279 7 3	
Miscellaneous	1,126 0 9	1,189 1 9	
Total Receipts ...	4,859 6 0	5,456 13 9	
Charges.			
Establishment	3,872 15 1	3,876 0 10	
Travelling allowance	22 4 0	164 10 0	
Supplies and services.			
Charges for seed-grain	1 11 0	3 4 0	
Farm buildings	1,394 5 0	375 12 0	
Purchase of cotton and implements	1,541 7 0	101 6 0	
Feed and care of cattle	194 10 0	457 6 0	
Variable labour	73 4 0	171 13 11	
Sewage Farm	875 11 10	865 9 3	
Other charges	413 5 0	669 9 0	
Contingencies.			
Postage charges	20 5 0	38 3 0	
Telegram charges	0 8 0	...	
Country stationery	0 5 0	1 3 6	
Total charges ...	8,410 10 11	6,724 13 6	

Annexure E.

Programme of Experiments of the Experimental Farm, Nagpur, as it stood on the 1st June 1903.

Number of field.	Purpose of experiment.	Crop.			Special treatment.			Remarks.
		1st year.	2nd year.	3rd year.	1st year.	2nd year.	3rd year.	
A—I	Continuous manure experiments with irrigated wheat.	Wheat ...	Wheat ...	Wheat ...	Saltpetre (40 lbs. nitrogen per acre).			
II		Do. ...	Do. ...	Do. ...	Bone-dust (do.) ...			
III		Do. ...	Do. ...	Do. ...	Saltpetre and bone-dust (25 lbs. of saltpetre and 15 lbs. of bone-dust).			
IV		Do. ...	Do. ...	Do. ...	Cattle-dung (40 lbs. nitrogen per acre).			
V		Do. ...	Do. ...	Do. ...	Cattle-dung and bone-dust (25 lbs. of cattle-dung and 15 lbs. of bone-dust).			
VI		Do. ...	Do. ...	Do. ...	Ashes of cattle-dung containing 40 lbs. nitrogen per acre).	Same as in first year.	Same as in first year.	
VII		Do. ...	Do. ...	Do. ...	Unmanured.			
VIII		Do. ...	Do. ...	Do. ...	Green manured with san (seed 100 lbs. per acre).			
IX		Do. ...	Do. ...	Do. ...	Manured with Kadoojira (tillage as in plot 8).			
X		Do. ...	Do. ...	Do. ...	Saltpetre (20 lbs. nitrogen per acre).			
XI		Do. ...	Do. ...	Do. ...	Do. (top-dressing).			
XII		Do. ...	Do. ...	Do. ...	Farm-yard manure (40 lbs. nitrogen per acre).			
B—I	Continuous manure experiments with dry crop wheat.	Wheat ...	Wheat ...	Wheat ...	Saltpetre (40 lbs. nitrogen per acre).			
II		Do. ...	Do. ...	Do. ...	Bone-dust (do.)			
III		Do. ...	Do. ...	Do. ...	Saltpetre and bone-dust (25 lbs. of saltpetre and 15 lbs. of bone-dust),			
IV		Do. ...	Do. ...	Do. ...	Cattle-dung (40 lbs. nitrogen per acre).			
V		Do. ...	Do. ...	Do. ...	Gattle-dung and bone-dust (25 lbs. of cattle-dung and 15 lbs. of bone-dust).			
VI		Do. ...	Do. ...	Do. ...	Ashes of cattle-dung containing 40 lbs. nitrogen per acre.	Do. ...	Do. ...	

VII		Do. ...	Do. ...	Do. ...	Unmanured ...			
VIII		Do. ...	Do. ...	Do. ...	Green manured with san (seed 100 lbs. per acre),			
IX		Do. ...	Do. ...	Do. ...	Manured with Kadoojira (tillage as in plot 8).			
X		Do. ...	Do. ...	Do. ...	Saltpetre (20 lbs. nitrogen per acre).			
XI		Do. ...	Do. ...	Do. ...	Do. (top dressing).			
XII		Do. ...	Do. ...	Do. ...	Farm-yard manure (40 lbs. nitrogen per acre).			
C-I	Effect on irrigated wheat of manure applied in June and August.	Wheat ...	Wheat ...	Wheat ...	Cattle-dung (40 lbs. nitrogen per acre in June).	Do.	Do.	
II		Do. ...	Do. ...	Do. ...	Do. in August ...			
III	Effect on unirrigated wheat of manure applied in June and August.	Do. ...	Do. ...	Do. ...	Do. in June ...	Do.	Do.	
IV		Do. ...	Do. ...	Do. ...	Do. in August ...			
D-I	Effect on cotton and juar-tur in rotation of manure.	Cotton ...	Juar-tur (mixed.)	Cotton ..	Bone-dust (40 lbs. nitrogen per acre).	.....	Do.	
II		Do. ...	Do. ...	Do. ...	Unmanured ...			
III		Do. ...	Do. ...	Do. ...	Farm-yard manure (40 lbs. nitrogen per acre).			
IV		Do. ...	Do. ...	Do. ...	Farm-yard manure (20 lbs. nitrogen per acre).			
V		Do. ...	Do. ...	Do. ...	Pondrette (40 lbs. nitrogen per acre).			
VI		Do. ...	Do. ...	Do. ...	Saltpetre (40 lbs. nitrogen per acre).			
VII		Do. ...	Do. ...	Do. ...	Do. (20 lbs. nitrogen as top-dressing per acre).			
VIII		Do. ...	Do. ...	Do. ...	Bone-dust and saltpetre (15 lbs nitrogen in bone-dust and 25 lbs. of nitrogen in saltpetre per acre).			
E-I	Effect of tillage to various depths on irrigated wheat grown continuously.	Wheat ...	Wheat ...	Wheat ...	Scarified every year ...	Same as in first year.	Do.	
II		Do. ...	Do. ...	Do. ...	Ploughed with one country plough and scarified.			
III		Do. ...	Do. ...	Do. ...	Ploughed with Swedish plough and scarified.			
F-I	Rotation of coriander and linseed.	Coriander ...	Linseed ...	Coriander ..	*Nil* ...	*Nil* ...	*Nil* ...	Light dressing of farm-yard manure every fourth year and to irrigate to save the crop withering during drought year.
II		Linseed ...	Coriander ...	Linseed ...				
G-I	Effect of rotation with irrigation.	Wheat ...	Wheat ...	W heat ...	*Nil* ...	*Nil* ...	*Nil* ...	Plots to be manured every fourth year with light dressing of farm-yard manure containing 40 lbs. nitrogen per acre. Regular irrigation to be given.
II		Do. ...	Lakh ...	Do. ...				
III		Do. ..	Gram ...	Do. ..				
IV		Wheat and gram mixed.	Wheat and gram mixed.	Wheat and gram mixed.				
V		Wheat with subordinate rows of safflower.	Wheat with subordinate rows of safflower.	Wheat with subordinate rows of sufflower.				
VI		Wheat ...	Sessamum ...	Wheat ...				

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on 24 February, 2020

Programme of Experiments of the Experimental Farm, Nagpur, as it stood on the 1st June 1903.—(Concld.)

Number of field.	Purpose of experiment.	Crop. 1st year.	Crop. 2nd year.	Crop. 3rd year.	Special treatment. 1st year.	Special treatment. 2nd year.	Special treatment. 3rd year.	Remarks.
H -I	Dry crop rotations with wheat.	Wheat ...	Wheat ...	Wheat ...	*Nil.* ...	*Nil.* ...	*Nil.* ...	To be manured lightly every fourth year with farm-yard manure containing 40 lbs. nitrogen. Light irrigation if absolutely necessary.
II		Do. ...	Lakh ...	Do. ...				
III		Do. ...	Gram ...	Do. ...				
IV		Wheat and gram mixed.	Wheat and gram mixed.	Wheat and gram mixed.				
V		Wheat with subordinate rows of safflower.	Wheat with subordinate rows of safflower.	Wheat with subordinate rows of safflower.				
VI		Wheat ...	Sessamum ...	Wheat ...				
I-I	Rotation experiments with kharif crops.	Cotton-tur ...	Cotton-tur ...	Cotton-tur ...	*Nil.* ...	*Nil.* ...	*Nil.* ...	To be lightly manured in the year in which cotton is grown with farm-yard manure (40 lbs. nitrogen per acre). Irrigation to be given to rabi crops to save withering.
II		Do. ...	Juar ...	Do. ...				
III		Do. ...	Sessamum ...	Do. ...				
IV		Cotton ...	Cotton ...	Cotton ...				
V		Cotton-juar ...	San as fibre crop.	Cotton-juar ...				
VI		Cotton ...	Juar ...	Cotton ...				
VII		Cotton-juar ...	Wheat ...	Cotton-juar ...				
VIII		Do. ...	Gram ..	Do. ...				
IX		Do. ...	Wheat and gram mixed.	Do. ...				
J-I	Manured on juar with subordinate tur continuously without rotation.	Juar-tur ...	Juar-tur ...	Juar-tur ...	Saltpetre (20 lbs. nitrogen per acre, drilled).	Same as in first year.	Same as in first year.	
II		Do. ...	Do. ...	Do. ...	Unmanured.			
III		Do. ...	Do. ...	Do. ...	Cattle-dung (20 lbs. nitrogen per acre, drilled).			
IV		Do. ...	Do. ...	Do. ...	Saltpetre (20 lbs. nitrogen per acre, top-dressed).			
1	Experiments with steeping seed in different solutions.	Wheat ...	Wheat ...	...	Sodium sulphide ...	...	...	Size of each plot should be about $\frac{1}{10}$ acre for wheat.
2		Do. ...	Do. ...	...	Potassium sulphide ...	...	...	
3		Do. ...	Do. ...	...	Copper sulphate ...	...	...	
4		Do. ...	Do. ...	...	Hot water ...	...	...	
5		Do. ...	Do. ...	...	Untreated ...	...	...	

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